Amendments to the Claims

1. (currently amended) A method for testing a transformer using a test signal having a particular frequency, the method comprising:

measuring a plurality of parameters of the transformer when the transformer is excited by ~~the test signal~~ applying a periodic test signal at different frequencies to a secondary of the transformer, wherein eddy current resistance of the transformer is one of the parameters of the transformer; ~~and~~

deriving a simulation model for the transformer using the plurality of measured parameters, the simulation model representing operating parameters at a plurality of frequencies other than the particular frequency of the test signal; and

deriving the eddy current resistance by measuring power absorbed by the secondary of the transformer when the test signal is applied.

2. (original) The method of claim 1, wherein the frequency of the test signal is lower than the nominal frequency of the transformer, and wherein the behavior of the transformer when it is operated at the nominal frequency is determined with the aid of the simulation model.

3. (original) The method of claim 1, wherein the test signal is applied to the secondary of the transformer, and wherein the parameters of the transformer are measured at the secondary of the transformer.

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4. (original) The method of claim 1, wherein the test signal is applied to the transformer with a voltage that is lower than the voltage required for measuring the knee point when the transformer is operated at the nominal frequency.

5. (original) The method of claim 1, wherein the test signal is used for measuring a plurality of frequency dependent, voltage dependent, or frequency and voltage dependent parameters of the transformer in order to derive the simulation model.

6. (original) The method of claim 1, wherein the resistance of a secondary winding of the transformer is one of the parameters, wherein a direct-current signal is applied as the test signal to the secondary of the transformer and wherein the voltage produced across the secondary of the transformer and the current flowing through the secondary of the transformer are measured in order to derive the resistance of the secondary winding.

7. (canceled)

8. (currently amended) The method of claim 1 ~~claim 7~~, wherein, to derive ~~measure~~ the eddy current resistance of the transformer, two measurements are performed at two different frequencies ~~f1 and f2~~ f_1 and f_2 and the power ~~P1 and P2~~ P_1 and P_2 absorbed by the transformer during the two measurements is measured, wherein the following equations are satisfied:

$$\cancel{P1 = \alpha \cdot f1 + \beta \cdot f12}$$
$$\cancel{P2 = \alpha \cdot f2 + \beta \cdot f22}$$

$$\underline{P_1 = \alpha \cdot f_1 + \beta \cdot f_1^2}$$
$$\underline{P_2 = \alpha \cdot f_2 + \beta \cdot f_2^2}$$

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where the factors α and β are determined as a function of the frequencies ~~f1 and f2~~ f_1 and f_2 and on the powers ~~P1 and P2~~ P_1 and P_2, as follows:

$$\alpha = \frac{P_1 \cdot f_2^2 - P_2 \cdot f_1^2}{f_1 \cdot f_2 \cdot (f_2 - f_1)}$$

$$\beta = \frac{P_2 \cdot f_1 - P_1 \cdot f_2}{f_1 \cdot f_2 \cdot (f_2 - f_1)}$$

in order to derive the eddy current resistance.

9. (currently amended) The method of claim 8, wherein the eddy current resistance R_{eddy} is determined via the following relation:

$$[[R_{eddy} = \frac{Uc^2_{rms1}}{\beta \cdot f_1^2} = \frac{Uc^2_{rms2}}{\beta \cdot f_2^2}]]$$

$$\underline{R_{eddy} = \frac{Vc^2_{rms1}}{\beta \cdot f_1^2} = \frac{Vc^2_{rms2}}{\beta \cdot f_2^2}}$$

where ~~Vcrms1~~ Vc_{rms1} designates the rms value of the voltage at the main inductance of the transformer during the measurement with the frequency ~~f1~~ f_1 and ~~Vcrms2~~ Vc_{rms2} designates the rms value of the voltage at the main inductance of the transformer during the measurement with the frequency ~~f2~~ f_2.

10. (original) The method of claim 1, wherein the plurality of parameters comprises a hysteresis curve of the transformer, the method further comprising:

applying a periodic signal to the secondary of the transformer;

measuring resulting current and voltage values at the secondary;

deriving, from the plurality of parameters, a voltage and current variation on the main inductance of the transformer as a function of an eddy current resistance of the transformer, in order to determine the hysteresis curve.

11. (currently amended) The method of claim 10, wherein the voltage V_c and the current I_L on the main inductance of the transformer are derived from the voltage V_{ct} measured at the secondary of the transformer, a current I_{ct} measured at the secondary, the resistance R_{ct} of the secondary winding of the transformer and the eddy current resistance R_{eddy}, as follows:

$$V_c = V_{ct} - R_{ct} \cdot I_{ct}$$

$$[[I_L = I_{ct} - \frac{Uc}{R_{eddy}}]]$$

$$\underline{I_L = I_{ct} - \frac{Vc}{R_{eddy}}}.$$

12. (currently amended) The method of claim 1, wherein the operating parameters of the transformer during operation with a frequency deviating from the frequency of the test signal and an arbitrary load on the secondary [[is]] <u>are</u> determined using the simulation model.

13. (currently amended) The method of claim 12, wherein the plurality of parameters comprises a resistance R_{ct} of the secondary winding, an eddy current resistance R_{eddy}, and a hysteresis curve that defines the variation of a voltage V_c and the variation of a current I_L in a main inductance of the transformer, the method further comprising:

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determining a variation of an interlinked flux of the transformer with time as a function of frequency;

deriving, as a function of the variation of the interlinked flux, a voltage V_c on the main inductance of the transformer; and

deriving, as a function of time, a current I_L in the main inductance of the transformer from the hysteresis curve, wherein a current I_{ct} flowing in the secondary winding and a voltage V_{ct} at the secondary winding are then determined for the particular frequency as follows:

$$[[I_{ct} = I_L + \frac{Uc}{R_{eddy}}]]$$

$$\underline{I_{ct} = I_L + \frac{Vc}{R_{eddy}}}$$

$$V_{ct} = V_c + I_{ct} \cdot R_{ct}.$$

14. (original) The method of claim 1, wherein a non-sinusoidal test signal is used as the test signal.

15. (original) The method of claim 14, wherein a square-wave signal is used as the test signal.

16. (currently amended) A test device for testing a transformer comprising:

a test signal source for applying a periodic test signal at different frequencies to a secondary of the transformer,

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a measuring device for measuring a plurality of parameters of the transformer with the test signal applied to the transformer, wherein eddy current resistance is one of the parameters of the transformer, and wherein power absorbed by the secondary of the transformer is determined to derive the eddy current resistance, and

an evaluation device for evaluating the parameters and for deriving from the parameters a simulation model that simulates the behavior of the transformer at different frequencies;

whereby the behavior of the transformer during operation with a frequency deviating from the frequency of the test signal is predicted with the aid of the simulation model.

17. (original) The test device of claim 16, wherein the measuring device and the evaluation device are integrated in a control unit which is constructed in the form of one or more of a controller, a computer, and a digital signal processor.

18. (original) The test device of claim 16, wherein the test device further comprises:

at least one test signal output connectable to the secondary of the transformer, and

a plurality of test inputs connectable to the secondary of the transformer for measuring the parameters of the transformer.

19. (original) The test device of claim 16, wherein the test device is integrated into a portable instrument.

20. (original) The test device of claim 16, wherein the test device has storage means for storing information comprising:

the measured parameters of the transformer;

the simulation model of the transformer; and

information which describes the behavior of the transformer during operation at the frequency deviating from the frequency of the test signal.

21. (original) The test device of claim 16, wherein the test device has an interface for transmitting information to an external device, the information selected from a group comprising (i) the measured parameters of the transformer, (ii) the simulation model of the transformer and, (iii) information which describes the behavior of the transformer during operation at the frequency deviating from the frequency of the test signal.

22. (original) The test device of claim 16, wherein the test device further comprises an interface for receiving external control signals for automatic control of a test sequence implemented by the test device.

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